Listing of Claims:

This listing of the claims is provided for the Examiner's convenience. No amendments are being made at this time.

1. (Previously Presented) An apparatus for modulating and demodulating signals transmitted and received via an electronically steerable phased array antenna comprising a plurality of antenna elements, the apparatus comprising:

a baseband modulator configured to modulate outbound digital baseband signals to be transmitted via the phased array antenna;

a baseband demodulator configured to demodulate incoming digital baseband signals generated from signals received via the phased array antenna; and

a shared baseband processor configured to receive digital baseband signals including the modulated outbound digital baseband signals and the incoming digital baseband signals, said shared baseband processor applying phases to the digital baseband signals to account for both beamforming phase rotation and carrier phase rotation of individual antenna elements.

2. (Previously Presented) The apparatus of claim 1, wherein said digital baseband signals received by said shared baseband processor are time multiplexed, and said shared baseband processor operates on said digital baseband signals on a time-slot-by-time-slot basis.

3. (Previously Presented) The apparatus of claim 1, wherein said baseband modulator receives data symbols from a plurality of user channels and supplies to said shared baseband processor a time-multiplexed stream of modulated digital data symbols from said plurality of user channels.

4. (Previously Presented) The apparatus of claim 3, wherein, for each input digital data symbol, said baseband modulator generates a plurality of modulated digital data symbols in the time-multiplexed stream respectively corresponding to the plurality of antenna elements.

5. (Previously Presented) The apparatus of claim 1, wherein said shared baseband processor comprises:

a numerically controlled oscillator configured to generate a stream of carrier phases for digital baseband signals of each of a plurality of user channels in a time-multiplexed manner;

a beamforming phase rotator configured to generate a stream of beam rotation phases corresponding to individual antenna elements for each of the plurality of user channels in a time-multiplexed manner;

a phase adder configured to sum the beam rotation phases and the carrier phases to produce a time-multiplexed stream of combined phase adjustments; and

a complex multiplier configured to adjust phases of a time-multiplexed stream of digital baseband signals corresponding to the plurality of user channels in accordance with the combined phase adjustments.

6. (Original) The apparatus of claim 5, wherein said combined phase adjustments index a sine/cosine lookup table which supplies multiplicands to said complex multiplier.

7. (Previously Presented) The apparatus of claim 1, wherein said shared baseband processor comprises a multiplier which performs complex multiplication on digital baseband signals relating to a plurality of user channels in a time-multiplexed manner.

8. (Previously Presented) The apparatus of claim 1, wherein said shared baseband processor comprises a multiplier which performs complex multiplication on digital baseband signals associated with a plurality of individual antenna elements in a time-multiplexed manner.

9. (Previously Presented) The apparatus of claim 1, wherein said shared baseband processor comprises a beam scaling and power control processor configured to generate a time-multiplexed stream of gain control signals for digital baseband signals corresponding to

individual antenna elements for each of a plurality of user channels, the gain control signals jointly accounting for power control and antenna element beam scaling; and

a multiplier configured to adjust amplitudes of a time-multiplexed stream of digital baseband signals corresponding to the plurality of user channels in accordance with the gain control signals.

10. (Previously Presented) The apparatus of claim 1, further comprising:

a baseband beamformer configured to receive time-multiplexed digital baseband signals from said shared baseband processor corresponding to individual antenna elements, said baseband processor forming a combined signal from said time-multiplex digital baseband signals.

11. (Previously Presented) The apparatus of claim 1, further comprising:

a plurality of digital down-converters respectively down-converting digitized signals received from the plurality of antenna elements to produce parallel streams of sampled digital baseband signals; and

a multiplexer receiving the parallel streams of sampled digital baseband signals and supplying a time-multiplexed stream of the sampled digital baseband signals to said shared baseband processor.

12. (Previously Presented) The apparatus of claim 11, wherein said plurality of digital down-converters perform decimation to reduce a sampling rate of the sampled digital baseband signals.

13. (Original) The apparatus of claim 11, wherein said plurality of digital down-converters separately down-convert digitized signals for each antenna element for each of a plurality of frequency channels.

14. (Previously Presented) The apparatus of claim 1, further comprising:

a demultiplexer receiving a time-multiplexed stream of digital baseband signals from said shared baseband processor and generating parallel streams of digital baseband signals corresponding to the plurality of antenna elements; and

a plurality of digital up-converters respectively up-converting the parallel streams of digital baseband signals to produce a plurality of digitized intermediate frequency signals corresponding to the plurality of antenna elements.

15. (Original) The apparatus of claim 14, wherein said plurality of digital up-converters perform interpolation to increase a sampling rate of the digitized intermediate frequency signals.

16. (Previously Presented) The apparatus of claim 14, wherein said plurality of digital up-converters separately up-convert digital baseband signals for each antenna element for each of a plurality of frequency channels.

17. (Original) The apparatus of claim 1, wherein signals are transmitted and received using time division duplex, said apparatus further comprising switching elements to selectively connect said shared baseband processor to said baseband modulator and front-end transmit circuitry for signal transmission and to said baseband demodulator and front-end receive circuitry for signal reception.

18. (Original) The apparatus of claim 1, wherein said apparatus employs time division multiple access (TDMA) to transmit and receive signals.

19. (Original) The apparatus of claim 1, wherein said apparatus employs frequency division multiple access (FDMA) to transmit and receive signals.

20. (Original) The apparatus of claim 1, wherein said apparatus is a field programmable

gate array (FPGA).

21. (Original) The apparatus of claim 1, wherein the apparatus is implemented via a very large scale integration (VLSI) circuit or an application specific integrated circuit (ASIC).

22. (Original) The apparatus of claim 1, wherein said apparatus is a modem.

23. (Original) The apparatus of claim 1, wherein said apparatus is a transceiver.

24. (Original) The apparatus of claim 1, wherein said apparatus is a basestation transceiver.

25. (Previously Presented) The apparatus of claim 1, wherein the shared baseband processor adjusts amplitudes of the digital baseband signals to perform power control and antenna element beam scaling.

26. (Previously Presented) A method of processing an RF signal received via an electronically steerable phased array antenna comprising a plurality of antenna elements, the method comprising:

(a) separately down-converting the RF signal from each antenna element to an intermediate frequency (IF) signal;

(b) separately analog-to-digital converting the IF signal from each antenna element;

(c) separately digitally down-converting the digital IF signal from each antenna element to a digital baseband signal to form a set of parallel baseband signals from the plurality of antenna elements;

(d) time multiplexing the set of parallel baseband signals to form a serial stream of digital baseband signals;

(e) applying phases to the digital baseband signals in the serial stream to account for both carrier phase tracking and antenna element beamforming; and

(f) performing beamforming by combining digital baseband signals respectively associated with the plurality of antenna elements.

27. (Previously Presented) The method of claim 26, wherein (c) includes decimating the digital IF signal from each antenna element to reduce a number of samples in the serial stream of digital baseband signal.

28. (Previously Presented) The method of claim 26, wherein (c) includes generating baseband signals for a plurality of frequency channels from the digital IF signal of each antenna element, such that digital samples in the serial stream of digital baseband signals are associated with a particular antenna element and frequency channel.

29. (Previously Presented) A method of processing signals to be transmitted via an electronically steerable phased array antenna comprising a plurality of antenna elements, the method comprising:

(a) generating a stream of digital baseband signals representing data symbols to be transmitted via the phased array antenna, wherein digital baseband signals in the stream are associated with individual antenna elements;

(b) applying phases to each of the digital baseband signals to account for both carrier phase rotation and antenna element beamforming;

(c) demultiplexing the stream of digital baseband signals into a plurality of parallel signals respectively associated with individual antenna elements;

(d) digitally up-converting the parallel signals to produce a plurality of digital intermediate frequency (IF) signals respectively associated with individual antenna elements;

(e) digital-to-analog converting the digital IF signals to produce a plurality of IF signals respectively associated with individual antenna elements; and

(f) up-converting the IF signals to RF signals for transmission via the phased array antenna.

30. (Previously Presented) The method of claim 29, wherein the phased array antenna simultaneously transmits signals on a plurality of frequency channels, and the stream of digital baseband signals includes signals associated with individual ones of the frequency channels.

31. (Previously Presented) The apparatus of claim 1, wherein the shared baseband processor applies a single phase adjustment to each of the digital baseband signals, wherein the single phase adjustment jointly accounts for both beamsteering phase rotation and carrier phase rotation.

32. (Previously Presented) The apparatus of claim 1, wherein the shared baseband processor generates a stream of combined phase adjustments by summing a stream of carrier phases for the digital baseband signals with a stream of beam rotation phases for the digital baseband signals, and adjusts phases of the digital baseband signals in accordance with the combined phase adjustments.

33. (Previously Presented) The method of claim 26, wherein (e) includes applying a single phase adjustment to each of the digital baseband signals in the serial stream, wherein the single phase adjustment jointly accounts for both beamsteering phase rotation and carrier phase rotation.

34. (Previously Presented) The method of claim 26, wherein (e) includes:

generating a stream of carrier phases for the digital baseband signals;

generating a stream of beam rotation phases for the digital baseband signals;

summing the beam rotation phases and the carrier phases to produce a stream of combined phase adjustments; and

applying the stream of combined phase adjustments to the digital signals in the serial stream to account for both carrier phase tracking and antenna element beamforming.

35. (Previously Presented) The method of claim 29, wherein (b) includes applying a single phase adjustment to each of the digital baseband signals, wherein the single phase adjustment jointly accounts for both beamsteering phase rotation and carrier phase rotation.

36. (Previously Presented) The method of claim 29, wherein (b) includes:

generating a stream of carrier phases for the digital baseband signals;

generating a stream of beam rotation phases for the digital baseband signals;

summing the beam rotation phases and the carrier phases to produce a stream of combined phase adjustments; and

applying the stream of combined phase adjustments to the stream of digital baseband signals to account for both carrier phase rotation and antenna element beamforming.